CLAIMS

The embodiments of an invention in which an exclusive property or right is claimed are defined as follows:

1. A method for analyzing the performance of a system wherein light is directed from at least one light source to an encoded portion of a rotating member of said system, said method comprising the steps of:

transmitting a portion of the light to said encoded portion of said rotating member;

detecting a transmitted portion of the light; and

recovering information from said transmitted portion of the light containing performance characteristic data of said system.

2. The method of claim 1 further comprising the step of:

configuring said light source as a Vertical Cavity Surface Emitting Laser (VCSEL).

3. The method of claim 1 wherein said encoded portion of said rotating member comprises a bar code.

4. The method of claim 1 wherein said encoded portion of said rotating member comprises at least one measuring feature formed on a planar surface of said rotating member.

5. The method of claim 4 wherein said at least one measuring feature formed on said planar surface of said rotating member comprises an optical encoder for encoding performance characteristic data of the system.

6. The method of claim 5 further comprising the step of:

configuring a plurality of measuring features to form a vernier for measuring movement within the system.

7. The method of claim 1 further comprising the step of:

shaping said encoded portion of said rotating member to increase transmission of said transmitted light in a particular direction.

8. The method of claim 1 further comprising the step of:

transmitting at least one light beam from said encoded portions of said rotating member to interact with at least one other light beam to form Moirè fringes on a sensor.

9. The method of claim 1 further comprising the step of:

assessing said system utilizing said performance characteristic data.

10. The method of claim 9 further comprising the step of:

generating an electrical feedback signal from information recovered from said transmitted portion of the light; and

providing said electrical feedback signal to an input of said system, thereby improving said performance characteristic data of said system.

11. An apparatus for analyzing the performance of a system having a rotating member therein, said apparatus comprising:

at least one directing element that directs light from a light source in order to intercept an encoded portion of said rotating member;

at least one transmitting element that transmits a transmitted portion of said light from said encoded portion of said rotating member; and

at least one detector that detects the transmitted portion of said light to recover performance information maintained therein, wherein said performance information contains performance characteristics of said system.

12. The apparatus of claim 11 further comprising:

recovery mechanism that recovers information about a performance characteristic of said system.

13. The apparatus of claim 11 further comprising a second rotating member with an encoded portion affixed thereto and wherein the detector detects a plurality of Moirè fringes formed as a result of the interaction of images from said encoded portions of said rotating member and said second rotating member.

14. The apparatus of claim 11 wherein the directing element comprises an optical lens.

15. The apparatus of claim 11 wherein said light source comprises a vertical cavity surface emitting laser (VCSEL).

16. The apparatus of claim 11 wherein said encoded portion of said rotating member comprises a bar code.

17. An apparatus for detecting the relative motion between at least two rotating members in a system having a light source for generating a light beam, said apparatus comprising:

transmissive mechanism located on a first rotating member for the transmission of said light beam from an encoded portion of said first rotating member;

transmissive mechanism located on a second rotating member for the transmission of said light beam through said encoded portion of said first rotating member; and

a detector for detecting Moirè fringes formed as a result of the interaction of images from said first and second encoded portions of said first and second rotating members, wherein said detection mechanism is located proximate to said system.

18. The apparatus of claim 17 further comprising:

a sensor for analyzing a signal from said detection mechanism, thereby monitoring the motion of said Moirè fringes, wherein said sensing mechanism is located proximate to said system.

19. The apparatus of claim 18 further comprising:

a collimating lens located proximate said system, wherein said collimating lens renders said light beam from said light source into a highly collimated parallel light beam, thereby directing said light beam to intercept said encoded portion on said first rotating member.

20. The apparatus of claim 17 wherein said light source comprises at least one vertical cavity surface emitting laser (VCSEL).

21. The apparatus of claim 17 wherein at least one light beam from said VCSEL is rendered highly collimated by a convex collimating lens before said at least one light beam intercepts at least one encoded portion of said first and second rotating members.

22. The apparatus of claim 21 wherein said at least one encoded portion comprises:

a transparent polymer film having parallel lines of opaque bar code imprinted on an upper surface of said transparent polymer film; and

wherein said opaque parallel lines are spaced evenly with a width of a gap formed therebetween, wherein the width of the gap corresponds to the width of said opaque parallel lines; and

wherein said transparent polymer film is fixed to a rotating member.

23. The apparatus of claim 22 wherein:

said transparent polymer film comprises a bar code when adhered to a rotating disk; and

wherein said bar code is adhered to a planar surface of a rotating member.

24. The apparatus of claim 23 wherein:

said light beam intercepts said first and second encoded portions of said rotating members at an angle of incidence of about 90°; and

wherein said light beam carries an image of said bar code after being transmitted through said encoded portions of said first and second rotating members.

25. The apparatus of claim 22 wherein an image from said first encoded surface interacts with an image of said second encoded surface after said light beam is transmitted through said second rotating surface to produce Moirè fringes.

26. The apparatus of claim 22 wherein Moirè fringes are observed on a sensor.

27. The apparatus in claim 26 wherein said sensor is located at a Talbot distance from a point where said light beam exits a bottom of said encoded surface of said second rotating member.

28. The apparatus of claim 17 wherein said detector is located on a sensor.

29. The apparatus in claim 17 wherein said encoded portion of the first rotating member is shaped to increase said transmitted light in a particular direction.

30. The apparatus of claim 17 wherein said encoded portion of the first rotating member is shaped to form an optical encoder for encoding information representing performance characteristics of said system.

31. The apparatus of claim 17 wherein said encoded portion of the first rotating member is provided as a vernier on said rotating member to increase accuracy for sensing motion thereof.

32. The apparatus of claim 17 wherein said encoded portion of the first rotating member comprises features recessed into a surface or edge of said rotating member.